Hastings International and Comparative Law Review

Volume 28
Number 2 *Winter 2005*

Article 7

1-1-2005

Opening the Pandora's Box of Space Law

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Introduction

> The greatest danger facing us in outer space comes not from the physical environment, however cold and hostile it may be, but from our own human nature and from the discords that trouble our relationship here on earth. Therefore, as we stand on the threshold of the space age, our first responsibility as governments is clear: we must make sure that man's earthly conflicts will not be carried into outer space.[1]

During the golden age of exploration, Pope Alexander VI resolved the question of sovereignty by drawing a line across a map of the New World.[2] All lands to the west of the line were given to Spain, and all lands to the east were given to Portugal.[3] To this day, while the majority of South Americans speak Spanish, the official language of Brazil is Portuguese. With the Pope's approval, Spain and Portugal pillaged their new lands of wealth. England, France, and Holland scrabbled for what possessions they could, creating an era of piracy, privateers, and open war.

As technological advances launched the world into a new era of exploration in the 1950s with the race into space, the world's two strongest nations took a new approach: instead of dividing the heavens among those capable of reaching them or creating a system

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1. Arthur J. Goldberg, U.S. Ambassador to the United Nations, Address to the United Nations General Assembly (Dec. 17, 1966).

2. *See* Ivan Shearer, *A Pope, Two Presidents and a Prime Minister*, 7 ILSA J. INT'L & COMP. L. 429 (2001) (the Pope divided the world in 1493; Spain and Portugal moved the line westward in 1494 with the Treaty of Tordesillas).

3. *Id.*

where the "right of grab" prevailed, the United States and the Soviet Union agreed that no nation would claim sovereignty over space.[4] In doing so, they succeeded in preventing the conflicts of eras past. However, they also created a powerful disincentive to engage in exploration: without sovereignty, jurisdiction cannot be imposed, laws cannot be applied, and investments cannot be secured.

To encourage investment, it is necessary for some body have sovereignty over space. Until now, concern over sovereignty and property rights in space has been largely academic. The only method available for getting into space is by rocket, and aside from the danger of strapping people or expensive satellites to a tube filled with explosives, the financial costs are extremely high.

Launching to Low Earth Orbit (LEO) at an altitude of 100 to 300 miles costs approximately $2,000 to $15,000 per pound, depending on the type of rocket used.[5] The final fuel price for 200 pounds of person, air, food, and water is approximately $400,000 to $3 million.[6] Launching to a Geosynchronous Earth Orbit (GEO) at an altitude of 22,300 miles costs $60,000 per pound on a rocket or $200,000 per pound on the Space Shuttle.[7] For 200 pounds, the cheapest ticket available to GEO is almost $12 million. These constraints put space exploration well out of the reach of most nations. Only three nations, the U.S., Russia, and China, have manned space programs.[8]

More importantly, the extreme expense puts severe limitations on what projects are deemed feasible. Scientific or humanitarian projects like the International Space Station (ISS) are prohibitively expensive. Interplanetary travel, such as a manned mission to Mars, which requires enough air, food, and water to sustain humans for a multi-year journey along with enough shielding to protect it all from

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4. Brandon C. Gruner, *A New Hope for International Space Law: Incorporating Nineteenth Century First Possession Principles Into the 1967 Space Treaty for the Colonization of Outer Space in the Twenty-First Century,* 35 SETON HALL L. REV. 299, 322-23 (2004).

5. David K. Pullen, *Space Elevators: The Time for Laughing is Over* (May 15, 2003) available at <www.physicspost.com>.

6. *Commercial Space Transportation: Beyond the X-prize: Hearing Before the House Comm. on House Transp. and Infrastructure, Subcomm. on Aviation*, 109th Cong. (2005) (statement of Will Whitehorn, President, Virgin Galactic) (suborbital commercial tourism is slated to begin in 2008 with Virgin Galactic at a price of just under $200,000).

7. Pullen, *supra* note 5.

8. CNN, *China's Astronaut Returns Safely* (Oct. 16, 2003), available at <www.cnn.com/2003/TECH/space/10/15/china.launch/>.

the intense radiation in space, is fiscally impossible unless a coalition of large nations dedicate significant resources to the project. Without a viable means to explore space, sovereignty is unimportant: if it is too expensive to even consider building a moon colony, the legal obstacles to construction are moot.

However, by April of 2018, a group of private companies plans to spearhead a new era of exploration.[9] The LiftPort Group expects to finish construction of one of the most novel and far-reaching structures ever devised: a Space Elevator.[10] Despite its fantastic nature, a Space Elevator is surprisingly simple: it is a cable hanging from orbit, upon which an elevator can travel from the surface of the Earth to GEO, some 22,300 miles up, and beyond.[11] Although previously a theoretical amusement and staple of science fiction, recent advances in materials science have made the construction of a Space Elevator possible.[12] With NASA papers and timelines also planning construction within the next few decades[13] the Space Elevator will effectively remove economic barriers to space exploration leaving the legal issues to be considered and dealt with.

While many of the issues can be handled by responsible engineering or through existing legal regimes, the problem of sovereignty in space creates more difficult challenges. This note considers the problem of sovereignty in space and suggests that an international organization, under the auspices of the United Nations, be given sovereignty over space, with a system of leases to provide property rights to industries and individuals.

With the earliest construction of the Space Elevator planned for 2018,[14] it might seem premature to argue for a new agency with sovereignty over space. However, with countries already planning

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9. LiftPort, at <www.liftport.com> (visited, Jan. 28, 2005) (shows LiftPort's intention to complete Space Elevator by 2018).

10. *Id.*

11. SPACE ELEVATORS: AN ADVANCED EARTH-SPACE INFRASTRUCTURE FOR THE NEW MILLENNIUM, NASA/CP-2000-210-429, 1 (Compiled by D.V. Smitherman, Jr.), available at <flightprojects.msfc.nasa.gov/fd02_elev.html> [hereinafter SPACE ELEVATORS].

12. *Id.* at 2.

13. *See* NASA'S FLIGHT PROJECTS DIRECTORATE AT MSFC, DEVELOPMENT OF SPACE: A PATH TO THE STARS, available at <flightprojects.msfc.nasa.gov/images/FD02_DOSmedres.jpg> (visited Feb. 8, 2004) [hereinafter NASA TIMELINE] (shows NASA plans to complete Space Elevator to low orbit by 2037); SPACE ELEVATORS, *supra* note 11.

14. LiftPort, *supra* note 9.

manned lunar bases[15] and fear of colonization and rivalry raising the specter of conflict,[16] questions of sovereignty are well-timed. Moreover, the magnitude of the undertaking necessitates an early start.

The United States threw maritime law into upheaval when the Truman Doctrine was announced in 1945.[17] Sixty years and three U.N. Conventions on the Law of the Sea later, there is still debate over how maritime law should function.[18] The United States has not yet ratified the U.N. Convention on the Law of the Sea III (UNCLOS III).[19] Because this note's proposal constitutes the most substantial overhaul of space law ever, there can be no valid concern about starting too early, only of starting too late.

Part I of this note will introduce the Space Elevator in more detail. A basic understanding of the Space Elevator concept is essential to realize the likelihood of its construction and the factors constraining it. Part II will examine the Outer Space Treaty (OST), which restricts sovereignty in space, and analyze how completion of the Space Elevator will expand the breadth of law needed for space. Part III asks which body of law should govern space and analyzes the Truman Doctrine and its impact to suggest that a unilateral application of sovereignty is not appropriate. Part IV proposes that an independent agency under the U.N. be given sovereign control over space and sketches some basic requirements. It concludes by examining whether such an agency would be politically acceptable.

PART I – The Space Elevator

"The Space Elevator will be built about 50 years after everyone stops laughing."[20]

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15. Associated Press, *Briefing*, NEWSDAY, Feb. 27, 2005 (Japan plans building a manned lunar base in 20 years); *Let Me Play Among the Stars*, NEW SCIENTIST, Dec. 25, 2004, at 20 (U.S., China, India, and the E.U. all to establish manned lunar bases).

16. *Moon Plan to Give U.S. Control Over Energy Sources*, HINDU, Jan. 26, 2004 (academician afraid that U.S. is seeking to control global energy market by owning lunar resources).

17. Colin B. Picker, *A View From 40,000 Feet: International Law and the Invisible Hand of Technology*, 23 CARDOZO L. REV. 149, 166-67 (2001).

18. Lynn M. Fountain, *Creating Momentum in Space: Ending the Paralysis Produced by the "Common Heritage of Mankind" Doctrine*, 35 CONN. L. REV. 1753, 1757 (2003).

19. James L. Malone, *The United States and the Law of the Sea*, VA. J. INT'L L. 785, 786 (1984).

20. Arthur C. Clarke, Address to the XXXth International Astronautical

A. Concept

The Space Elevator is a technological breakthrough that will revolutionize the exploration of space by reducing the costs of getting into space by orders of magnitude.[21] Currently, those with sufficient means can purchase a ticket to the International Space Station (ISS), 210 miles up, for $20 million.[22] By contrast, the Space Elevator will lift people past GEO, for little more than $2000 - far less than the cost of a transatlantic business-class airline ticket.[23]

To build the Space Elevator, a spool of ultra-lightweight, super-strong material would be taken to GEO and unwound. One end would lower towards Earth, while the other end would trail into space as a counter balance. As long as the center of mass of the entire system was in GEO, the whole cable would remain stationary and would "hang" from orbit.[24] A high-speed train would be mounted to the cable and ferry people and materials to orbit.[25] A station would be built at GEO, providing easy access to other spacecraft. The counterweight cable extending past GEO would act like a slingshot,[26] allowing cheaper and faster access to distant locations like the moon and Mars.[27]

As with any new technology, space transport will be initially expensive, estimated at $100/pound, but eventually drop in price to under $10/pound.[28] For 200 pounds, travel to GEO will drop from $12 million to $2,000. The Space Elevator is also reusable, allowing more missions than current systems.[29]

B. Construction

When Arthur C. Clarke first popularized the idea of the Space Elevator in his 1974 novel *The Foundations of Paradise*, engineers

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Congress, Munich (Sep. 20, 1979) available at <www.spaceelevator.com/docs/acclarke.092079.se.1.html>.

21. NASA TIMELINE, *supra* note 13; LiftPort, *supra* note 9.

22. Richard Stengar, *Soyuz Reserved for Private Trip to Space Station: Explorers Sought with $20 Million to Burn*, (Jun. 18, 2003) available at <www.cnn.com/2003/TECH/space/06/18/soyuz.tourists/index.html>.

23. SPACE ELEVATORS, *supra* note 11.

24. *Id.* at 3-6.

25. *Id.* at 4.

26. *Id.*

27. *Id.*

28. *Id.* at 1.

29. *Id.* at 4.

began to seriously consider the merits of the idea.[30] However, early research consigned it to the realm of science fiction because the technology to build such a structure did not exist.[31] Proponents realized that even the strongest composite materials were far too weak: a cable, if built, would snap under its own weight.[32] All sorts of exotic materials were postulated, from frozen hydrogen (25 times more explosive than dynamite) to positronium (which exists only for millionths of a second before decomposing into radioactive particles), none of which were viable.[33]

However, a new material, the carbon nanotube, presents extraordinary promise. Carbon nanotubes are similar to diamond or graphite, comprised only of carbon atoms. But instead of diamond's rigid latticework, carbon nanotubes are sheets of carbon atoms, arranged in hexagons, and rolled into cylinders.[34] The theoretical strength of these structures is immense. NASA studies estimate the tensile strength of carbon nanotubes at over 200 GPa.[35] If the Space Elevator were made from the best compounds commercially available today, the necessary materials would weigh 60 x 10^{12} tons.[36] However, a Space Elevator built from carbon nanotubes would only need to weigh 9.2 tons.[37] While research is being conducted to achieve this theoretical tensile strength, production of carbon nanotubes has moved the Space Elevator from the realm of science fiction to reality.

NASA expects the Space Elevator to be built within 35 years, while the LiftPort Group has committed to complete the Space Elevator within 13 years.[38] The main obstacle to construction is cost. The price of developing and building the Space Elevator is estimated to be $10 billion.[39] Even if this cost is underestimated by a factor of 10 and the final cost is $100 billion, it would be comparable to the ISS, a

30. *Id.* at 3.

31. Clarke, supra note 20.

32. *Id.*

33. *Id.*

34. Physical Properties of Carbon Nanotubes (compiled by Thomas A. Adams II) at <www.pa.msu.edu/cmp/csc/nanotube.html> (visited Feb. 10, 2004).

35. NASA, CARBON NANOTUBES, at <www.ipt.arc.nasa.gov/carbonnano.html> (visited Feb. 10, 2004).

36. SPACE ELEVATORS, *supra* note 11, at 7; 60 x 10^{12} is 60 followed by 12 zeroes, or sixty trillion.

37. *Id.*

38. NASA TIMELINE, *supra* note 13; LiftPort, *supra* note 9.

39. BBC, *Space Elevator Takes Off* (Aug. 12, 2002), available at <news.bbc.co.uk/2/hi/technology/2188107.stm>.

bargain compared to the Apollo program ($150+ billion), and dirt cheap compared to President George W. Bush's proposed rocket-propelled trip to Mars (nearly $1 trillion).[40] Cost will not continue to be an obstacle. The question is not if the Space Elevator can or will be built, but what will happen *after* its construction.

PART II – Law and the Space Elevator

> The exploration and use of outer space, including the moon and other celestial bodies, shall be carried out for the benefit and in the interests of all countries, irrespective of their degree of economic or scientific development, and shall be the province of all mankind.[41]

A. The Current State of Space Law

Four agreements form the foundation of current space law; only two deal with sovereignty: the Moon Treaty and the OST. The Moon Treaty refers to the moon and other celestial bodies as the common heritage of all mankind and calls for them to be used for the benefit and interests of all countries.[42] However, the Moon Treaty has not been signed or ratified by the major space-faring powers, and is widely considered to be defunct.[43] By comparison, the OST has been signed by 27 countries and ratified by 98, including all of the current space-faring nations.[44]

The OST was conceived in 1957 as the Space Race was intensifying.[45] Both the Soviet Union and the United States feared that the winner would claim sovereignty over space, keeping the loser

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40. David Perlman, *Bush to Announce Plan to Send Men to Mars: Huge New Space Initiative Could Take Decades, Cost Billions*, S.F. CHRONICLE, Jan. 9, 2004, at A1 (Cost of the ISS has exceeded $60 billion); *The Apollo Program: Back to the Moon and Beyond*, U.S. NEWS AND WORLD REPORT, Jan. 26, 2004, at 48 (Cost of the Apollo program in today's dollars is over $150 billion); *3, 2, 1, 0... Wait a Second*, L.A. TIMES, Jan. 14, 2004, B12 (manned Mars mission has an "estimated $1-trillion cost").

41. Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, *opened for signature* Jan. 27, 1967, art. 1, 18 U.S.T 2410, 610 U.N.T.S 205 [hereinafter the "Outer Space Treaty" or "OST"].

42. Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, *opened for signature* Dec. 5, 1979, art. 15, 1363 U.N.T.S. 21, 23 [hereinafter the "Moon Treaty"].

43. Fountain, *supra* note 18, at 1764.

44. Outer Space Treaty, *supra* note 41.

45. Gruner, *supra* note 4, at 321.

and the rest of the world out.[46] Given the possibility of open war between the two superpowers, it was clear that conflict should not be brought into space. The U.N. General Assembly passed Resolution 1348 (XIII) calling on nations to "avoid the extension of present national rivalries into this new field."[47] This resolution forms the backbone of the OST.

The U.S. representative to the United Nations during the OST negotiations stated that "as we stand on the threshold of the space age, our first responsibility as governments is clear: we must make sure that man's earthly conflicts will not be carried into outer space . . . [The OST] responds to that desire and hope."[48] To meet this goal, the OST bars claims of sovereignty over space and celestial bodies by use or appropriation.[49] It seeks to keep national rivalries and conflicts out of space by denying national interests in space[50] and refers to space as the "province of all mankind."[51]

Not only has the OST been signed and ratified by all the current space-faring nations, but the provisions of the OST have been adhered to. This is partly because it has proven too expensive to make use of celestial bodies with existing technology, but mostly because nations recognize the value of keeping national rivalries out of space. "Space law makers have the unique motivation to avoid the extension of present national rivalries into this new field."[52] To argue that our current state of American hegemony will continue is short-sighted.[53] If the nations of Earth have territories in space when

46. Erza J. Reinstein, *Owning Outer Space*, 20 NW. J. INT'L L. & BUS. 59, 62 (1999). In a quote made famous in film, Lyndon B. Johnson was quoted as saying that he did "not intend to go to sleep by the light of a communist moon." Rand Simberg, *The Dawning of our Downfall*, at <www.foxnews.com/story/0,2933,64739,00.html> (visited Feb. 9, 2004).

47. G.A. Res. 1348 (XIII), U.N. GAOR, 13th Sess., Supp. No. XX, at 5, U.N. Doc. XX (1958).

48. ARTHUR J. GOLDBERG, 90TH CONG., STAFF OF SENATE COMM. ON AERONAUTICAL AND SPACE SCIENCES, 90TH CONG. REPORT ON TREATY ON PRINCIPLES GOVERNING THE ACTIVITIES OF STATES IN THE EXPLORATION AND USE OF OUTER SPACE, INCLUDING THE MOON AND OTHER CELESTIAL BODIES 15 (Comm. Print1967).

49. OST, *supra* note 41, art II.

50. *Id.*

51. *Id.* at art I.

52. Eric Husby, *Sovereignty and Property Rights in Outer Space*, 3 J. INT'L L. & PRAC. 359, 363 (1994).

53. Michael J. Glennon, *The Rise and Fall of the U.N. Charter's Use of Force Rules*, Rudolf B. Schlesinger Lecture on International and Comparative Law, 27

conflict arises, space will simply become another theater of conflict. Conflict in space would be devastating, to both people and economies. Any assignment of sovereignty must heed the goals of the OST and keep national rivalries and conflicts out of space.

B. Space in the Post- Space Elevator is Valuable

Consider the ramifications of cheap and easy access to space: no longer will space exploration be limited to wealthy countries. Small countries will also be able to participate. Not only countries, but businesses and private individuals will be able to visit and work in space. Companies will flourish, designing low-cost space suits and space yachts for the wealthy. The theoretical orbital and lunar hotels developed by Hilton and Bigelow will become realities.[54] Stations dwarfing the ISS will be built, filled with researchers from companies like Genentech and 3M, all working to develop new products in the unique environment of zero-gravity.[55] Operators will take tourists on package tours: "Around the world in 90 minutes." However, not all prospective participants are benign: terrorist groups and criminal organizations may find ways to further their interests by expanding operations into space.

The opportunities for mining celestial resources are incredible. The moon is a large source of Helium-3 (He-3), a rare isotope ideal for certain forms of nuclear energy.[56] He-3 is very rare on Earth, and is worth $15 billion per ton.[57] Even more astonishing are the Class-M ("M" for metallic) Near Earth Asteroids (NEAs).[58] NEAs are relatively close to Earth compared to Mars, and occasionally even closer than the moon.[59] They contain metals in concentrations far in excess of those of the richest mines on Earth. Even the smallest NEA

HASTINGS INT'L & COMP. L. REV 497, 505 (2004).

54. Dr. David Whitehouse, *Hilton to Back Space Hotel* (Mar. 9, 1999), available at <news.bbc.co.uk/1/hi/sci/tech/293366.stm>; Julie Wakefield, *Book Me a Double – With a View of Venus*, WIRED (Jan. 2001), available at <www.wired.com/wired/archive/8.01/rocketman.html>.

55. *International Space Station: Hearing Before the Senate Comm. on Commerce, Science, and Transp., Subcomm. on Science, Technology and Space*, 104th Cong. (1997) (statement of Daniel S. Goldin, Administrator, NASA).

56. Susanne Quick, *A Mine on the Moon? Lunar Helium Seen as Clean Energy Source*, SEATTLE TIMES, Jan. 24, 2004, at A3.

57. Fountain, *supra* note 18, at 1786.

58. *Id.* at 1785.

59. William Barton & Michael Capobianco, *Harvesting the Near-Earthers*, AD ASTRA 27 (Nov. 1989).

contains more metal than has been mined in the whole of human history.[60] The market value of one asteroid is almost $5 trillion.[61] Why haven't we already exploited NEAs? Getting to space with a rocket is too expensive. If pure gold was floating in orbit, and all we had to do was collect it, the effort would lose money. The cost of launching a rocket into orbit costs more than the value of the gold we could retrieve. But, with travel costs at $10 per pound on the Space Elevator, asteroid mining and He-3 collection become enormously profitable.

C. The Necessity for New Laws and Regulations

However, the access made possible by the Space Elevator also threatens to open a Pandora's box of difficulties. The paucity of actual law in the OST leaves many questions about what would happen in various situations. The patchwork of treaties that currently define space law works sufficiently well for the handful of government astronauts using government spacecraft for government missions. However, a permanent lunar colony will need a much broader body of law: tort, probate, contract, criminal, and bankruptcy. Orbital research stations will also raise questions about antitrust and patents. Everything will create concerns over health and safety regulations.

The Space Elevator makes things possible that will demand a comprehensive set of laws. However, without sovereignty, there is no basis for jurisdiction, and laws cannot be enforced. There must be some sovereignty in space.

Expanding the current system is a flawed solution. Although treaties work well when cooperation is needed - e.g., for building and maintaining a space station - they flounder when cooperation is no longer necessary.[62] If a nation does not need to constrain itself to gain benefits, self-restraint is irrational.[63] This is problematic for persuading nations to ratify a treaty, as well as for enforcement once in effect. Coalition networks also tend to be inflexible, as treaties require much negotiation and compromise to form.[64] Once formed,

60. *Riches in the Heavens*, FINANCIAL TIMES, Jul. 16, 1999, at Inside Track 14.

61. *Id.*

62. *See* Jonathan D. Greenberg, *Does Power Trump Law?*, 55 STANFORD L. REV. 1789 (2003).

63. *Id.* at 1793, 1802.

64. Eric J. Pan, *Authoritative Interpretation of Agreements: Developing More*

the difficulty of amendment often creates significant resistance to change.[65] Any system of law robust enough to satisfy the needs of space-based businesses and communities will have to continually evolve and respond to changes in technology and circumstance. Any network of treaties attempting to resolve space law will be the product of more compromises than treaties; the result will be an inefficient, unmanageable tangle of conflicting standards and regulations.

Article I of the OST calls space "the province of all mankind."[66] When the United States and the Soviet Union were looking into the heavens at the beginning of the Space Race, they realized that dangers lurked ahead. Reflect on the history of exploration and you will find conflict.[67] Examine the history of colonization and you will find exploitation.[68] The U.S. ambassador to the U.N. said of the OST: "[W]e must make sure that man's earthly conflicts will not be carried into space."[69] Whatever the resolution, space law must heed this ideal, or risk chaos and conflict.

PART III – The Problem of Unilateral Sovereignty

> Until now our strivings toward peace have been heavily burdened by legacies of distrust and fear and ignorance and injury. Those legacies do not exist in space. They will not appear there unless we send them on ahead.[70]

Many scholars have attempted to resolve the issue of sovereignty by advocating a unilateralist approach.[71] However, such an approach violates the ideals of the OST and would generate difficulties. Any attempt to claim sovereignty by one nation would prompt similar

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Responsive International Administrative Regimes, 38 HARV. INT'L L. J. 503, 507 (1997).

65. *Id.*

66. OST, *supra* note 41, art I.

67. *See e.g.* Joseph C. Sweeney, *From Columbus to Cooperation – Trade and Shipping Policies from 1492 to 1992*, 13 FORDHAM INT'L L. J. 481, 487 (1990).

68. *See e.g.* Remigius N. Nwabueze, *Ethnopharmacology, Patents and the Politics of Plants' Genetic Resources,* 11 CARD. J. INT'L & COMP. L. 585, 590 (2003).

69. Goldberg, *supra* note 48, at 15.

70. Lyndon B. Johnson, U.S. Senator, Address to the United Nations General Assembly (1958).

71. *E.g.* Lawrence L. Risley, *An Examination of the Need to Amend space Law to Protect the Private Explorer in Outer Space*, 26 W. ST. U. L. REV. 47, 69 (1998-1999) (stating that "The Space Treaty is wrong. Free Enterprise must rule activities in outer space.").

claims from other space-faring nations as well as nations without manned space programs.

When the United States claimed jurisdiction over its continental shelf in the 1945 Truman Doctrine, it was motivated by the development of new technologies to exploit those resources.[72] The United States had the ability to drill for offshore oil and sea crust mining was considered to be fast approaching.[73] Soon afterwards, other nations extended their jurisdiction as well,[74] even if they could not yet exploit the resources themselves. They wanted the ability to exclude those who already had the requisite technology from "stealing" their resources.

Territory, whether above sea level or part of the continental shelf, is limited. Whenever finite resources are concerned, conflict ensues. With the Truman Doctrine, the United States claimed jurisdiction and control over the continental shelf and created a new limited resource. Not wanting to lose out, other countries began claiming whatever territory they could. However, multiple countries made claims over the same territories, creating conflict. Some countries even claimed territory that contained vital shipping routes and threatened to restrict access.

The United States could not simply deny troublesome claims; it had to challenge them or the silence would be interpreted as acquiescence and the claims could become law by custom.[75] The United States still expends much time and effort in formally challenging claims through diplomatic channels, even holding multilateral talks to resolve them.[76] Often, the United States must also back these challenges militarily, sending warships to demonstrate the international nature of the contested waters.[77] The United States challenges 30 to 40 claims a year militarily.[78] The risk of violence is obvious: the claiming nation must support their claim militarily as well or renounce the claim altogether. The risk is not theoretical. Challenging warships have been fired upon, hit mines, and collided

72. Picker, *supra* note 17.

73. *Id.* at 193.

74. William J. Aceves, *The Freedom of Navigation Program: A Study of the Relationship Between Law and Politics*, 19 HASTINGS INT'L & COMP. L. REV. 259, 266 (1996).

75. *Id.* at 304.

76. *Id.* at 289.

77. *Id.* at 294.

78. *Id.*

with defending ships, often resulting in damage and occasionally resulting in loss of life.[79]

Space is also a limited resource. Despite its infinite expanse, our current knowledge of the laws of physics makes space surprisingly small. For example, certain regions of Mars are more hospitable than others, and are therefore more valuable locations for exploration than those that require more expensive life support systems.[80] Similarly, the physics of gravity have conspired to create cosmic highways and checkpoints, specific "LaGrange" points in space that are more effiecient to travel between.[81] Control of LaGrange points could yield control over interplanetary trade routes and there are very few of these points.[82] These limited resources create the potential for conflict. If the United States claims territory in space, other nations will follow, and the United States will be forced to challenge their claims.

With the Space Elevator in place, most nations will have the ability to reach space and establish temporary, if not permanent, settlements. What happens when conflicts between these settlements erupt? Given the amount of territory represented by a planet, a moon, a significant number of asteroids, and countless orbital paths around each, not to mention the amount of empty space separating it all, the cost of projecting strength and settling disputes is incalculable.

The United States might only regulate its own claims, leaving protection of other territories to the countries that claim them. While this isolationist approach might work in an era of relative peace and international cooperation, it will fail as soon as a major conflict emerges. World War II proved that the world has become too interdependent for the United States to remain uninvolved.

Further, national claims in space will not be contiguous. Valuable resources are randomly distributed and may be separated by thousands, or even millions of miles. American individuals and organizations may have thousands of claims over hundreds of regions on dozens of different celestial bodies. Simply guarding and

79. *Id.* at 294-310.

80. *E.g. Mars Temperature: Clear Skies*, at <www.ucls.uchicago.edu/MartianSunTimes/images/MarsTemp-clear.jpeg> (visited Feb. 7, 2004) (shows temperatures between -80° and 0° Celsius near the equator, and temperatures at -120° and below near the poles).

81. Douglas L. Smith, *Next Exit 0.5 Million Kilometers*, LXV CalTech E&S 4 (2002), available at <pr.caltech.edu/periodicals/EandS/articles/LXV4/exit.html>.

82. *Id.*

protecting all these areas will be costly. Particularly valuable territory will likely be awash in competing claims. The bureaucratic costs of sorting through and resolving the territorial overlaps and managing this web of scattered claims are staggering.

PART IV – Practicality of the Agency

> What I consider of most basic importance, however, is that this Treaty offers States an opportunity to lift themselves out and above current issues and interests and build a framework-if only skeletal in form-for the future pattern of mankind's activity.[83]

A. Proposed International Space Sovereign

The creators of the OST built an idealistic framework. They did not intend the OST to be the extent of space law. Instead, they designed it to be a foundation for future expansion. The basic hope of the OST was for nations to step back from the fears and conflicts of the day and see space as a territory untouched by human history. On this clean slate, the OST wrote basic rules to preserve space from the conflicts that plagued Earth.

Now, with technology making sovereignty in space an issue again, the Space Elevator promising cheap and universal access to space, and academics beginning to call for sovereignty in space, it is time to take the skeletal framework of the OST and give it muscle. The underlying ideals of the OST should be given a body of laws and a decision-making government. There should be a single entity given sovereign jurisdiction over space and celestial bodies. This entity should be independent of national rivalries and conflicts, have recognized neutrality, and represent the "common heritage of all mankind" in the spirit of the OST.

To create this entity, an independent agency should be formed under the auspices of the United Nations and given sovereign control over space. It should have legislative powers to create and maintain the myriad laws and regulations necessary to make space safe for travel and investment, executive powers to enforce those laws and regulations, and judicial powers to resolve the disputes that will inevitably arise.

A discussion of the precise details of this proposed agency falls

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83. Arthur J. Goldberg, U.S. mission to the United Nations, Press Release No. 4914 (Sep. 19, 1966).

outside the scope of this paper. Instead, this note will attempt to identify some basic requirements and suggested solutions.

First and foremost, the agency should follow the ideals of the OST by representing the peoples of Earth while minimizing the influence of any one nation or group of nations. While a democratic system of some sort would be ideal, it should not require unanimity, which invariably results in courting the lowest common denominator and failure to achieve goals. One possible system would be an assembly where the members represented supra-national regions. By representing a geographical area rather than specific nations, the members might be further isolated from national issues.

In order to retain autonomy and independence, the agency will need to be self-sufficient and self-supporting. Funding should prove easy to find for an entity with sovereign control over space. Taxation on sales in space, travel, property, and income are all possible. Funding would be available even before the Space Elevator is built: taxing satellites would easily pay for the initial costs of such an agency. Satellite orbits are a limited commodity. The prized and very limited GEO slots are especially valuable. The satellite industry generated $86.8 billion in 2002, and has seen annual growth of 15 percent over each of the last 6 years.[84]

One of the most important functions of a sovereign space agency would be to introduce a system of property rights in order to encourage investment and exploration of space. While some have argued that complete ownership creates incentives for safe investment and industry,[85] ceding such control is imprudent. The new agency must retain ownership of celestial bodies as a bulwark against unforseen future conditions. However, leases would convey sufficient property rights to make investment safe and predictable, while retaining sufficient rights to make agency regulation effective.

Property rights vital to investment, especially the right to exclude, could be provided by lease. Industries seeking to mine an asteroid could obtain a lease, during which they could legally exclude others from mining the same asteroid. The right to transfer could be acquired by the lessee, creating a secondary market for "previously owned" lands on celestial bodies and providing an incentive for capital improvements and sustainable industry. In addition to

84. Satellite Industry Association, *Satellite Industry Statistics: 2002*, at <www.sia.org/industry_overivew/> (visited Feb. 8, 2004).

85. Reinstein, *supra* note 46, at 78.

providing a constant stream of income for the agency, a system of leases would permit the agency to inspect industries for adherence to safety and environmental regulations. More importantly, it would add the threat of eviction as a strong and final remedy should fines and market forces not curb destructive practices.

The agency would have control over which lands to offer for lease and which to withhold. This provides several advantages: the agency could encourage sustainable colonies by grouping leaseholds together geographically, as well as assure that even the late-comers to space exploration will not arrive to find only distant, inhospitable territory available. The agency would be able to buffer against the chaos of exploration and provide some measure of safety and order to the spread of humanity. Finally, should alien life be found, the agency would have the power to quarantine the area for isolation and safe study.

B. Will the Agency be Accepted?

Commentators doubt that nations would ever give up sovereignty over a valuable resource to an international organization.[86] A major issue facing the Antarctic Treaty was the preponderance of claims which pre-dated negotiations.[87] No nation was willing to renounce their claim and the claims skewed the results of the Treaty.[88] The hobbled Antarctic Treaty became a political creation only, subservient to the aspirations of a few nations[89] rather than the goals of all mankind. However, in space, there is no sovereignty to relinquish, only the hope of future claims. The nations able to claim sovereignty over space designed the OST specifically to deny themselves that ability. Those countries, and all those who have since signed and ratified the OST, have adhered to it. No claims of sovereignty over space exist: no country has a claim to lose. By establishing an agency now, we can avoid the political quagmire that crippled the Antarctic Treaty.

In order for an agency to exert power over space-faring nations, it must be legitimated by consensus, because it is highly unlikely that

86. Picker, *supra* note 17, at 185-86.

87. Patrick T. Bergin, *Antarctica, The Antarctic Treaty Regime, and Legal and Geopolitical Implications of Natural Resource Exploration and Exploitation*, 4 FLA. J. INT'L L. 1 (1988).

88. *Id.*

89. *Id.*

it could impose its will through force. With sovereign control over space, the agency would impose its laws on those in space, and its authority to do so must be recognized. As the agency will not gain authority through use of force, it must gain authority via legitimacy. Professor Thomas Franck described four properties as providing legitimacy: determinacy, symbolic validation, coherence, and adherence.[90]

Determinacy is the clarity of the goal. Actions are more legitimate when the goals that motivate them are easily discernible and understood.[91] Further, the specificity that follows from clear and determinate goals makes it difficult for nations to evade those goals. As Franck explains, "if a party seeking to justify its conduct interprets a rule in such a way as to evoke widespread derision, then the rule has determinacy. The violator's evidently tortured definition of the rule can be seen to exceed its range of plausible meanings."[92] The shame and fear of future reciprocity in the international arena generally prevents obvious flouting of agreements, and determinacy makes it difficult to construe violations as anything else. A clearly conceived and written constitution organized around specific goals would provide the agency with determinacy. It would be obvious that the agency was neutral to Earthly conflicts and rivalries and that its only goal was the safe migration of humanity to the stars.

Symbolic validation is generated from the formalities observed in the creation of a rule and the rule's adherence to history.[93] By grounding itself in structures and systems that have proved durable in the past, the new rule gains the legitimacy of those older systems. When the Soviet Union collapsed in 1991, a democratic entity that had never existed before raised the flag that predated the Soviet revolution.[94] By flying the old flag of Russia, the new government robed itself in legitimacy. A new agency with sovereignty over space would likewise inherit the legacies of both the United Nations and the OST. The neutrality of the United Nations and the ideals of the OST would lend credibility to the rules and regulations of the new agency.

Coherence is the ability of a new system to mesh seamlessly with

90. Thomas M. Franck, *Legitimacy in the International System*, 82 AM. J. INT'L L. 705, 712 (1988).

91. *Id.* at 713.

92. *Id.* at 715.

93. *Id.* at 725.

94. Wikipedia, *Flag of Russia*, at <en.wikipedia.org/wiki/Flag_of_Russia> (visited Jan. 24, 2005).

older systems.[95] The more substantial a break a new system makes from what is known and accepted, the less legitimate the new system is. An important corollary is that the system must be self-coherent.[96] If a rule accumulates too many exceptions, it becomes incoherent.[97] Self-determinism is an example of a system that declined from coherence to incoherence.[98] So long as self-determinism was universally applied, it was maintained;[99] once the principle was denied to some ethnic groups, it lost coherence and fell out of use.[100] This new agency is little different than many systems that currently function. It follows two traditions: the sovereign, which creates laws and enforces them, and the OST, which isolates space from Earthly conflicts and prohibits national ownership of space. So long as the agency maintains its independence from national concerns and rivalries, it will maintain its coherence.

Finally, there is adherence: the extent to which a system reflects the values of society.[101] Specifically, adherence relates to the existence of a community that adheres to a set of rules.[102] If only one nation ratifies a treaty, there is little adherence or expectation that the rules will be followed. By binding the new agency to a constitution which supports the same, widely upheld, values as the U.N. charter and the ideals of the OST, the rules promulgated by the new agency would be linked to a set of values held in common by the nations of the world.

95. Franck, *supra* note 90, at 741.
96. *Id.*
97. *Id.*
98. *Id.*
99. *Id.* at 743-44.
100. *Id.* at 745-46.
101. *Id.* at 752.
102. *Id.* at 752.

Conclusion

> We know that not all these conflicts are easily or quickly ended. But it has for years been the deep desire and hope of many countries, my own included, that the danger which they pose might be reduced; that the extension of them into new realms might be prevented; and that this might be achieved in ways which would advance the interests of all nations.[103]

The very nature of exploration, whether the theoretical exploration of new ideas or the physical exploration of new lands, confronts us with unanticipated situations and difficulties.[104] Breakthrough technologies that open new areas of exploration always result in new laws to deal with new problems.[105] These new laws are almost always ad hoc, the result of trial and error as legislators try to remedy the immediate problems at hand.[106] Over time, this legal accretion results in a body of law that is often incomplete and inconsistent.[107] Inevitably, there is some crisis that could have been prevented if comprehensive, well-designed laws were in place.[108] So, meetings are held, laws are proposed, and treaties are written. But now the slow, gradual accretion of law is itself the problem. Customs exist, countries and industries have battled for laws and regulations that they will not retreat from, positions are entrenched, and compromises are difficult. The time of exploration has expired; its clean slate is gone. Ideal solutions are no longer politically viable.

Any approach that does not abandon national concerns will eventually fail. Unless space is controlled by a strong and independent entity, it will become another theater of conflict and rivalry, perpetuating old cycles of history. No one country can hope to survive on Earth while attempting to control and regulate all of space. If space were to be fractured along national lines, the potential for conflict would be a powder keg, and the transmission delays in communication would make it difficult to keep the fuse unlit - especially with nations vying over valuable resources in physically

103. Arthur J. Goldberg, *supra* note 1.
104. *See* Picker, *supra* note 17, at 151-53.
105. *See Id.* at 151-56.
106. *Id.* at 183.
107. *See, e.g., Id.* at 164-83.
108. *See generally, Id.*

hostile and dangerous environments.[109]

One entity controlling space, with no bias to favor or antagonize particular nations, could receive recognized authority. With no sovereign claims, the job of regulating and controlling becomes easier: there are fewer conflicts to manage. Commerce can grow because there is stability and reliable law. There is recognized authority for criminal and civil matters. There is one source for safety and environmental regulation. It doesn't depend on which nation controls what plot of lunar soil, or whether a person's nation of origin ratified the treaty. Traveling to space should be like visiting a foreign country. Doing business in space should be like doing business abroad. The rules of space would be analagous to rules that already exist and familiarity would stabilize a dangerous environment.

With a single unified entity controlling space, we can open Pandora's Box without releasing the evils of Earthly conflict.

109. Andrew G. Wilson, *The Fifty Year War: Conflict and Strategy in the Cold War*, NAVY WAR C. REV., Oct. 1, 2003, at 174 (describes the need for rapid communications to avoid conflict stemming from incidents); California Space Institute, *Mars Exploration*, available at <calspace.ucsd.edu/Mars99/docs/library/mars_exploration/robotic_missions/orbiters/mars_global_surveyor/misc1.html> (visited Mar. 1, 2004) (because of the distances involved, it takes light between 4 minutes to 21 minutes to go from Earth to Mars).